SIMULATOR FOR BOARD SPORTS

TECHNICAL FIELD

The invention relates to a simulator for board sports. In particular the invention relates to a simulator able to be used both for determining a rider's stance and also as a training aid.

BACKGROUND ART

In recent years, there has been great growth in board sports such as snowboarding, kite surfing, wake boarding, motorised skateboarding etc. As in other sports where an object is manipulated by a person, the person aims to approach an optimal movement of his body and the object. This optimal movement would allow a minimal effort to result in a maximal effect such as, for example, a maximal weight transfer onto an edge when riding a snowboard. In board sports where the rider's feet and lower legs are to a degree fixed relative to a board or platform then it is generally considered that correct stance is necessary to approach this optimal movement.

Although an incorrect or sub-optimal stance can be employed, such a stance imposes an additional burden upon a beginner during the strenuous and potentially expensive learning phase. This burden could be reduced if a better stance had been adopted initially. At worst, a rider may be so unsuited to a stance that it poses a heightened risk of possible injury.

As beginners are often fully pre-occupied with mastering numerous skills, the subtle effects of stance changes are often completely overlooked. Consequently, a rider may retain a particular stance setting provided on their first board for a

considerable time, without experimentation. This makes beginners reluctant to vary their stance before they have gained a greater degree of ability.

Riders are further discouraged in experimenting with variations in stance because of the difficulty in making meaningful assessments of the adjustments to the equipment. Attempting to compare the results of different settings between runs is fraught with variables outside the rider's control.

A board rider's stance can be varied in a number of ways. A typical snowboard, for example, has two longitudinally spaced boot bindings that support both feet, often offset at a substantial angle with respect to the longitudinal centreline of the snowboard. This cross-orientation of the bindings allows the rider to assume a side-forward stance, which is the necessary anatomical positioning for optimal in-use control of the snowboard.

It is often the case that either a boot worn by the rider or the binding itself will be provided with a support for the lower leg with a variable degree of forward lean. Stance can also be varied by adjusting the angle between the midline of the foot and the centreline of the snowboard and this is often significantly altered for different snowboarding styles, e.g. freestyle or slalom racing. However, when the angle of the midline of the foot with respect to the board is changed, this can also change the angle of forward lean. Other degrees of freedom are also available, however within these restraints the “ideal” stance may be optimally adapted to the anatomical measurements and dynamic qualities of the rider.

Mechanical surfboards help a surfer learn balance and dynamically determine the effect of adjustments on the width of his stance on his ability to balance, however they do not allow the simulation of board sports, such as snowboarding, where the rider's feet are fixed relative to the board. Snowboard simulating devices which a

rider can use on a trampoline allow the simulation of dynamic conditions with feet fixed to a platform, however they provide no means to determine the effect of adjustments of the rider's stance.

There are also other snowboard simulators described in the prior art, such as Canadian patent CA 2 209 030 and US patent US 4 966 364. None of these simulators allows the rider to dynamically experience the effects of a stance adjustment. In particular they have no provision for fixing the bindings for movement toward and away from one another for adjusting the spacing between the bindings while the rider is held upon the simulator by the bindings.

It would be desirable to provide a device for determining a rider's stance for board sports and which addresses the above-mentioned disadvantages.

Typically snowboard training is undertaken on ski fields in formal lessons and/or through self-teaching. The learning phase of snowboarding can be very strenuous and traumatic to many novices due to the inevitable falls incurred and while training devices such as the above-mentioned mechanical surfboards and snowboard simulating devices can assist beginners in learning the movements involved in various board sports, these devices do not provide for increased difficulty of movements as learner's skill level increases. A relatively accessible and safe means of practising movements for board sports which can be made progressively more challenging will enhance the learning phase as well as benefiting experienced riders.

Therefore, it would also be desirable to make available a training device which addresses the above-mentioned disadvantages and which makes possible an improved and cost-effective progressive training in a course of movement for board sports.

All references, including any patents or patent applications cited in this specification are hereby incorporated by reference. No admission is made that any reference constitutes prior art. The discussion of the references states what their authors assert, and the applicants reserve the right to challenge the accuracy and pertinency of the cited documents. It will be clearly understood that, although a number of prior art publications are referred to herein, this reference does not constitute an admission that any of these documents form part of the common general knowledge in the art, in New Zealand or in any other country.

It is acknowledged that the term 'comprise' may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification, and unless otherwise noted, the term 'comprise' shall have an inclusive meaning - i.e. that it will be taken to mean an inclusion of not only the listed components it directly references, but also other non-specified components or elements. This rationale will also be used when the term 'comprised' or 'comprising' is used in relation to one or more steps in a method or process.

It is an object of the present invention to address the foregoing problems or at least to provide the public with a useful choice.

Further aspects and advantages of the present invention will become apparent from the ensuing description which is given by way of example only.

DISCLOSURE OF THE INVENTION

According to one aspect of the present invention there is provided a simulator for board sports including:

a pair of foot bindings for holding a rider's feet;

a pivoting mount assembly for pivoting both the foot bindings about a first simulator

axis to simulate pivoting movement of a board, and characterised in that

at least one of the foot bindings is attached to the pivoting mount assembly for movement toward and away from the other of the foot bindings for adjusting the spacing therebetween while the rider's feet are held by the foot bindings.

The simulator allows a rider to simulate at least one pivoting movement that is made to manoeuvre a snowboard, or the like. The movement between the bindings toward and away from one another is preferably a linear movement. It will be understood that while a pivoting pavement may move part of a binding toward and away from the other binding, the relative movement must be of the whole binding. Preferably the movement is linear sliding movement e.g. the at least one binding is fixed for sliding on a linear track, in a linear slot, or the like. The rider is thereby able to dynamically determine the effect of adjustments on the width of his stance (determined by the spacing between the foot bindings) on his ability to balance about the first simulator axis.

In the preferred embodiment the pivoting of the foot bindings about the first simulator axis is adapted to simulate edge-to-edge roll movement of a board about its longitudinal or roll axis, the at least one of the foot bindings, or both of the foot bindings, being mounted for sliding movement in a direction substantially parallel to the first simulator axis. It will be understood that pivoting about the longitudinal or roll axis of a board is important in steering the board to transfer weight between the opposing longitudinal edges of the board.

Optionally the simulator may be adapted for simulating pivoting or rotation about a pitch axis and/or about a yaw axis of the board. In addition to pivoting about the first simulator axis therefore, the simulator may include means for pivoting both the foot bindings together about mutually orthogonal pitch and yaw axes, both of which are perpendicular to the first simulator axis.

Advantageously the foot bindings are fixed together for pivoting about the first simulator axis. The foot bindings may be fixed to a platform for simulating a snowboard, or the like. Most preferably, for simulating the manner of mounting foot bindings on a snowboard, the foot bindings include boot bindings. A support is fixed to the pivotal attachment for supporting the foot bindings, preferably upon the ground. A handle may be fixed to the support to assist the rider and prevent a fall.

The pivoting mount assembly preferably includes at least one resilient pivot upon which the boot bindings are supported to provide the pivoting movement about the simulator axis while also biasing a foot-supporting surface of each foot binding toward the horizontal plane. Alternatively, the pivotal attachment may include a journal and separate resilient means.

Most preferably the pivoting mount assembly includes two elastomeric pivots mounted for sliding movement parallel to the first simulator axis for movement between a widely spaced position to provide substantially roll movement of the boot bindings about the first axis, and any one of more closely spaced positions configured for providing an increased degree of pivoting movement of the bindings about mutually orthogonal pitch and yaw axes, both of which are perpendicular to the first simulator axis.

In a preferred embodiment both foot bindings are adapted to be simultaneously moved for adjusting the spacing between the foot bindings in a direction substantially parallel to the first simulator axis. This may be achieved, for example, by a screw-type adjuster, manually or power-operated linear actuators etc. Optionally one or both foot bindings are fixed in a track extending parallel to the first simulator axis for movement to adjust the spacing between the foot bindings. The means for adjusting the spacing between the foot bindings is preferably a screw-type adjuster, but it will be understood that other manually or power-operated linear actuators may also be used. The screw-type adjustment

mechanism is preferably connected to the at least one foot binding for sliding the at least one foot binding toward and away from the other of the foot bindings for adjusting the spacing therebetween while the rider's feet are held by the foot bindings. When both the bindings are mounted for sliding movement the adjustment mechanism includes: a screw threaded adjuster rod having a handle; a screw block received on the adjuster rod; sliding blocks connected to the bindings, and an arm pivotally connected to each sliding block and to the screw block.

The simulator may further include means for measuring the spacing between the centres of the foot bindings, such as a ruler. An alignment indicating device, such as a plumb line or level, may also be provided to assist in aligning the centre of the rider's knee vertically with his foot. The alignment indicating device may include a knee-receiving cup fixed to each foot binding, the position of the knee-receiving cup being adjustable to align with the knees of different users, the cup being adjustable in a plane extending orthogonally to a foot-supporting surface of the binding and substantially aligned with the centre of the rider's foot. A rod assembly may be fixed to the binding, extending generally perpendicular to a base of the binding or platform and able to telescope to align vertically with the knees of different height users.

In addition to this freedom of adjustment of the foot bindings in the longitudinal direction, the simulator preferably includes means for adjustment of the foot bindings by rotation of each foot binding about a central axis substantially intersecting with and extending orthogonally to the first simulator axis for adjusting the angle between ~~the midline of the foot~~ and the first simulator axis.

Means may also be provided for movement of the foot bindings lateral to the first simulator axis. The means for means for providing each of these adjustments is preferably adapted to allow for adjustment while the rider is held in the foot bindings e.g. by a separate operator or by remote control means operated by the

rider.

The simulator preferably further includes a rider's seat, upon which the rider may sit with his feet secured by the bindings. Additionally, an operator's seat may also be provided for seating an operator while he operates the adjustment mechanism. The rider's seat and operator's seats are preferably fixed on opposing sides of the pivoting mount assembly.

According to another aspect of the present invention there is provided a simulator for board sports including:

a pair of foot bindings for holding a rider's feet;

a pivoting mount assembly for pivoting both the foot bindings about a first simulator axis to simulate pivoting movement of a board, and characterised in that

the pivoting mount assembly includes two elastomeric pivots mounted for sliding movement parallel to the first simulator axis for movement between a widely spaced position to provide substantially roll movement of the boot bindings about the first axis, and any one of more closely spaced positions configured for providing an increased degree of pivoting movement of the bindings about mutually orthogonal pitch and yaw axes, both of which are perpendicular to the first simulator axis

This invention provides a simulator which is effective and efficient in operational use, and which is versatile in operation, allowing it to be used to assist board riders determine their stance and also for training riders in different courses of movement. The simulator may be economically constructed and has an overall simple design which minimizes manufacturing costs.

BRIEF DESCRIPTION OF THE DRAWINGS

Further aspects of the present invention will become apparent from the following description which is given by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a perspective view of the simulator of the present invention;

Figure 2 is an exploded view of the simulator of Fig. 1;

Figure 3 is a front elevation of the simulator of Fig. 1;

Figure 4 is an exploded pictorial view of the mount of the simulator of Fig. 1;

Figure 5 is an exploded pictorial view of part of the platform assembly of the simulator of Fig. 1;

Figure 6 is an exploded pictorial view of the boot bindings of the simulator of Fig. 1, and

Figure 7 is an exploded pictorial view of the alignment indicating device of the simulator of Fig. 1

BEST MODES FOR CARRYING OUT THE INVENTION

Referring to Figs 1 - 3, a simulator 100 according to the present invention for board sports, and in particular snowboarding, is shown having a frame 30 with a rider's seat 31 and an operator's seat 32 positioned either side of a platform assembly 33 supported on a pivoting mount 34. The platform assembly 33 includes a platform 5 to which a pair of foot bindings or boot bindings 2a, 2b are mounted for holding the a rider's feet while the mount 34 allows the platform assembly 33 to pivot primarily

about a first simulator axis A to simulate edge-to-edge roll of a snowboard about its longitudinal centreline.

The frame 30 includes a rider's seat framework 35 and an operator's seat framework 36 fixed by a joining member 37. Both frameworks 35, 36 are of like shape and have horizontal portions 35a, 36a for supporting the frame upon the ground and 35b, 36b for supporting the seats 31, 32.

The mount 34 includes an elongate base 38 rigidly fixed upon the joining member 37 and which supports an elongate pivoting member 39 connected by front and rear resilient pivots 3a, 3b .

The boot bindings 2a, 2b are fixed for sliding movement in linear slots 41a, 41b in the platform 5 and the platform assembly 33 further includes a rotating handle 40 for controlling the sliding movement of the boot bindings 2a, 2b. An alignment indicating device 42 is fixed to each of the boot bindings 2a, 2b.

As best seen in Fig. 4, the pivots 3a, 3b are moulded from an elastomeric material about a central threaded shank 43 which protrudes from either end for engagement with upper and lower jaws 44a, 44b for clamping engagement with the pivoting member 39 and base 38 respectively. The pivots 3a, 3b are symmetrical about the long axis of the shank 43 and either side of a central waisted section 45 which defines the first simulator axis A. Upper and lower faces of the pivots 3a, 3b are parallel to bias the platform 5 toward the horizontal plane. The base 38 is a rectangular hollow section and the pivoting member a channel, both with cutouts 48a, 48b, 49a, 49b for access to the jaws 44a, 44b. The pivoting member 39 is received between and may be restrained by the end plates 47 fixed to the ends of the base 38. The upper end of the shank 43 of each pivot 3a, 3b is received in a

slot 46a, 46b in the pivoting member, with corresponding slots (not shown) in the base 38 in order that the longitudinal position of the pivots 3a, 3b may be varied.

An adjustment mechanism 50, shown in Fig. 5, forms part of the platform assembly 33 and is provided for adjusting the spacing between the boot bindings 2a, 2b in the longitudinal direction. The mechanism 50 slides blocks 51a, 51b in the slots 41a, 41b. The blocks 51a, 51b are connected to the boot bindings 2a, 2b and with pivots 54, 55 to pivoting arms 52a, 52b, each of which are connected to a screw block 53. A threaded shaft 56 has one end fixed to the handle 40 and the other received in a threaded aperture in the block 53. The shaft 56 is fixed for rotation in saddle blocks 57 to the underside of the platform 5. In this manner, rotation of the handle 40 simultaneously slides the blocks 51a, 51b toward or away from a central position on the platform 5. Measurement indicia (e.g. a ruler - not shown) or other means is provided to allow the operator to measure the longitudinal spacing between the centres of the bindings 2a, 2b.

The simulator 100 can also be readily adapted to support a rider upon a separate snowboard (not shown). After removing the boot bindings 2a, 2b, a separate snowboard may be supported upon the platform 5, the resilient support pads 77 holding the snowboard in place.

As seen in Fig. 6, mounting and support for the rider's booted feet and the lower legs is provided by each individual binding 2a, 2b which also forms part of the platform assembly 33. The bindings 2a, 2b are fixed to the sliding blocks 51a, 51b by means of a binding disc 59 and secured by central fasteners 60. Each binding disc 59 defines an axis of rotation B, C which intersects the first simulator axis A (axes B and C extending vertically when axis A extends horizontally). No stops limit the rotational movement of the bindings 2a, 2b, which can rotate through 360 degrees. Rotation of the foot plate 60 connected by the disc 59 about axes C, D

varies the angle between the midline of the foot (i.e. a line from the heel to the toe) and the longitudinal centreline of the platform 5. A scale (not shown) is provided on the discs 59 or foot plate 60 to allow angular measurements to be determined.

Each foot plate 60 has a flat foot-supporting surface, as illustrated in Fig. 7. Mounted to the rear of the foot plate 60 is a high back leg support 12. The high back leg support 12 is preferably rigid, but it may be adjustable for rotation about respective axes normal to the axes B, C to provide a variable degree of forward lean. The high back leg support 12 has openings 62a, 62b for slidably receiving the opposing parallel edges 61a, 61b of the foot plate 60. At the front edge of the foot plate 160 a recess 65 is provided for receiving a bracket 66 (Fig. 7) of an alignment indicating device 42. Fixed to the leg support 12 a spring-biased detent 63 is provided for engagement with recesses 64 in the edges 61a, 61b. In this manner, adjustment of the position of the rider's foot is provided in the direction of axis D, generally orthogonal to the axes B, C.

The components of the alignment indicating device 42 are shown in Fig. 7 and include a mounting bracket 66 fixed at one end of an elongate telescoping assembly 67 having a knee cup 68 fixed at one end thereof. The telescoping assembly 67 comprises a bar 69 to which the L-shaped bracket is fixed such the bar 69 extends upwardly from the front and centre of the foot plate 60. The telescoping assembly 67 further comprises an elongate tubular member 70 slidingly received on the bar 69 and having a detent 63 fixed thereto for engagement with recesses 71 in the bar 69 to fix the height of a knee-receiving cup 68 fixed to the end of the member 70. The knee-receiving cup 68 includes a stem 72 received in a aperture 74 in the end of member 70 and may be fixed by pin 74 in any one of openings 75 in the stem 72. In this manner the position of the

knee-receiving cup 68 may be adjusted in a plane (not shown) extending orthogonally to the platform 5 and aligned with the centre of the rider's foot.

The simulator 100 may be used for two main purposes: primarily it allows dynamic adjustments to be made to a rider's stance allowing a suitable stance to be readily determined, and a secondary purpose is to allow users to practice a range of movements applicable to board sports.

To determine a suitable stance for a novice rider the pivots 3a, 3b are clamped at their maximum longitudinal spacing (at opposing ends of the slots 46a, 46b). In this position, movement of the platform 5 is largely restricted to pivoting about the first simulator axis A to simulate edge-to-edge roll of a snowboard. The rider (not shown) is secured to the simulator 100 by the bindings 2a, 2b in an initial narrow stance, where the bindings 2a, 2b are relatively close together in the longitudinal direction (parallel to axis A). The high back leg support 12 is adjusted for the size of the rider's boots to position his feet centrally on the foot plates 60. The angle of the bindings 2a, 2b are adjusted by rotation about the respective axes B, C normal to the platform 5 to a suitable initial stance.

With support initially from the seat 31 the rider 1 attempts to stand and balance the platform 5, maintaining it horizontal, while the operator slowly winds the handle 40 to move the bindings 2a, 2b and widen the rider's stance. As the stance is widened, the rider is able to feel a point at which he can balance the platform. This "correct" stance can be verified by use of the vertical indicating device 42. The operator adjusts the ~~vertical and horizontal~~ position of the knee cups 68 so that the rider's knees are received therein. This verifies that the centre of the rider's knee is properly aligned with his foot.

This same dynamic process can be repeated with variations in the angle of each

binding 2a, 2b about axes B, C described above to determine a comfortable stance, approaching an optimal, which is suited to the anatomical measures and dynamic qualities of the rider.

It will also be understood that the simulator allows for improved training, allowing a rider to practice courses of movement, and, for example, to allow a trainer to make ready observations to assist the learning process. By adjusting the position of the pivots 3a, 3b the characteristics of the simulator can be varied. As the pivots 3a, 3b are positioned closed together the rotary freedom of movement of the platform 5 is increased, and whereas at maximum spacing the movement is largely roll movement about longitudinal axis A, at minimum spacing a degree of pitch and yaw rotation are provided (about respective axes perpendicular to axis A). The amount of freedom of movement may thus be adjusted to suit the user's progress through the learning process, making use of the simulator progressively more challenging even as the user increases in skill.

Aspects of the present invention have been described by way of example only and it should be appreciated that modifications and additions may be made thereto without departing from the scope thereof as defined in the appended claims.